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THESIS

OPERATIONALIZING MOBILE APPLICATIONS FOR HUMANITARIAN ASSISTANCE/DISASTER RELIEF MISSIONS

by

Carlton B. Summerville

March 2014

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13. ABSTRACT (maximum 200 words)

When a natural disaster, such as an earthquake, has occurred, the critical information communications technology (ICT) infrastructure is often completely destroyed or damaged to a point of ineffectiveness. For first responders, such as the military, government relief agencies, and non-governmental organizations, quick and reliable communication tools are essential for carrying out their missions.

As technology continues to evolve, more tools are becoming available to first responders in humanitarian assistance and disaster relief (HA/DR) missions. These tools are improving relief strategies in many ways by providing real-time or near real-time situation updates and data essential to the mission. There are mobile applications under development and commercially available are aimed at improving the ability of HA/DR responders to make assessments.

This research assesses the implementation of applications used on mobile devices while enhancing the ICT of the disaster area for first responders during HA/DR missions. This includes a setup of a hastily formed network in order to establish a wide area network to provide a network for the applications to work. The use of such applications can drastically improve information sharing, interoperability, command and control, and coordination among responders between all agencies involved.

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OPERATIONALIZING MOBILE APPLICATIONS FOR HUMANITARIAN ASSISTANCE/DISASTER RELIEF MISSIONS

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LIST OF ACRONYMS AND ABBREVIATIONS

AOR	area of responsibility
BGAN	Broadband Global-Area Network
BHR	Bureau of Humanitarian Response
CIDNE	Combined Information Data Network Exchange
COIN	counterinsurgency operations
COOP	continuity of operations plan
COP	common operational picture
CN	counter-narcotics
COTS	commercial off-the-shelf
EOC	Emergency Operations Center
FLAK	fly-away-kit
FIST	Field Information Support Tool
GPS	Global Positioning Satellite
HADR	humanitarian assistance and disaster relief
HFN	hastily formed network
ICT	information communications technology
IP	Internet protocol
ISVG	International Studies of Violent Groups
KM	knowledge management
KS	knowledge sharing
LMC	last mile connection
ODK	open data kit
RTAT	Rapid Technology Assessment Team
SATCOM	satellite communications
USAID	United States Agency for International Development
VPN	virtual private network
VSAT	Very Small Aperture Terminal
WEP	Wired Equivalent Privacy
WiMAX	Worldwide Interoperability for Microwave Access

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I. INTRODUCTION

A. OVERVIEW

Communication technology capabilities in HA/DR have attracted a fair amount of attention in recent history. Generally, communication is elemental since it links people and activities taking place in the society. Over the years, communication has been modified from basic landlines to wireless schemes prevalent today, and the technology is only getting better (Baron & Philbin, 2009). There is a need to adapt, modify, enhance, and improvise the current technology to provide the necessary means for communicating in HA/DR situations. In areas where a natural disaster has occurred, such as a massive earthquake, hurricane, or tsunami, the critical communications infrastructure is often completely destroyed or damaged to a point that renders it ineffective. For emergency responders, such as the military, government relief agencies, and non-governmental organizations (NGOs), quick and reliable communication tools are essential for carrying out their missions.

Emergency responders need defined interaction strategies that use and understand the importance of public networking. Just like any other organization, parties involved in catastrophe, relief, and comfort initiatives need a strategy that features public networking. Government linked parties play a vital role in aiding a catastrophe or emergency, and as such, they are the experts in problem nullification (Marchetti, 2010). They are fast responders in a catastrophic situation, and they meet people's health care needs and provide aid in the placement of displaced individuals in need. Governments also play significant roles in HA/DR. Government associated groups are at times, able to offer financial support alongside volunteers in periods of catastrophe. Government agencies are also able to offer catastrophe preparation resources for such areas.

With regard to HA/DR management, communication technology has played a major role for a long time. However, communication capabilities are not being used to their full potential in HA/DR scenarios. The four main distinct HA/DR phases are mitigation, recovery, response and preparedness. The modifications seen in

recent technological schemes show great potential for integration within different communication systems. Various communication systems that relate include radio, phones, television and computers, among others. These communication devices deeply rely on networks to deliver messages to the intended parties. Application of new communication technology in prevention and mitigation is steadily increasing. There are technical and social aspects that directly relate to the application of communication systems in disaster management (Arambepola, Abeysinghe & Bandara, 2009). The social and economic context of application greatly counts in putting such systems into application.

B. PROBLEM STATEMENT

A problem is that disasters vary from one region to another. During the initial days after any disaster begins, the communications infrastructure is typically dramatically degraded. Historical examples show minimal or no power, limited access to the Internet, interference in radio interoperability, degraded telephone services, unattainable satellite services, and few applications available. A significant contributory issue is that current applications are not producing an acceptable level of data sharing and processing in HA/DR scenarios. The level of communication deterioration can be extensive. The location can be extremely large, comprising several countries (for example, the 2004 Boxing Day earthquake/tsunami). The loss of communication schemes can also be unreliable. For example, during initial relief efforts to the 2010 Haitian Earth earthquake, there were few if any network relaying resources available for communication equipment and applications. In the aftermath of 2010’s Asian earthquake, HA/DR agencies had limited communication resources to pinpoint and relay locations of those in need of assistance.

C. PURPOSE STATEMENT

The purpose of this thesis is to assess the use of mobile applications on devices while enhancing the information communications technology (ICT) of the disaster area for responders during HA/DR missions. This includes a standard set up of a HFN in order to set up a WAN in which information can be shared between operators. Setting a

standard of use will improve information sharing, interoperability, command and control, and coordination among responders between all agencies.

> Technologies are widely available that, in the words of Berners-Lee, "will enable better data integration by allowing everyone who puts individual items of data on the Web to link them with other pieces of data using standard formats."2 Yet the humanitarian community is not collecting or analyzing data in this way yet; in fact, they are mired in methods that rely on documents—methods more suited to the Middle Ages than the Internet age. (Foundation & Vodafone Foundation Technology Partnership, 2011)

For fast implementation in the immediate disaster zone, responders must often physically carry devices into challenging remote access areas and create ad-hoc communication systems. Disaster area surroundings can change quickly, and responders may need to modify the abilities to use networks in any environment. Furthermore, there is need for an ICT design to set up an effective, constant, maintainable, convenient, IP-based device facility (Baron & Philbin, 2009) in the use of specific HA/DR applications.

D. OBJECTIVES

This thesis intends to improve the capabilities of existing HA/DR applications by maximizing the use of HFNs, identifying information to be shared within applications, and improving agency interoperability. Assuming that the ICT infrastructure of the disaster area has been completely destroyed or rendered inoperable, this thesis focuses on setting up an optimum HFN that will give a first responder the optimal use of a device, thus enhancing the use of applications on the device that share data to provide a near real-time analysis of the disaster environment. With the use of a rapidly deployable communications infrastructure, responders will be able use the mobile assessment applications on their devices to quickly provide essential data between all responders and agencies using the technology and even with those who are not. In the early moments post-disaster, it is essential for responders to assess the situation and share information amongst each other regardless their agency. A basic format and cooperative structure of use of the HFN and application technology will optimize the effectiveness of responders for HA/DR scenarios within all responding agencies.

E. BENEFITS OF THE STUDY

The potential benefits of this research of applications for HA/DR under the RTAT program umbrella, is primarily to improve the efforts of first responders to HA/DR scenarios. The primary purpose for establishing RTAT was to create a much needed mechanism for conducting a rapid assessment of the ICT status that would enable the host nation and the IHC to provide a targeted allocation of resources that would result in a reduction of gaps and duplication of effort (Steckler, 2012). Exploring the use of applications for HA/DR could provide continuous updates to the Common Operating Picture (COP) for responders, which could lead to faster response times, pinpoint of critical areas, and enhanced communication between all parties involved. The RTAT program also seeks to provide a pool of multi-disciplinary experts who are capable of rapidly deploying to a disaster zone (Steckler, 2012).

F. THESIS STRUCTURE

This thesis is organized as follows:

Chapter I: Introduction and overview of this thesis.

Chapter II: Introduces and defines the considered HA/DR applications and their functionalities.

Chapter III: :Discusses the operationalization and implementation of HA/DR applications and HFNs. Users requirements, assessments, coordination among HA/DR application users.

Chapter IV: Discusses what a hastily formed network is and how it is configured. Also discusses how it integrates with HA/DR applications.

Chapter V: Summarizes the operational testing and implementation of the technology

Chapter VI: Discusses the summary and future recommendations of this thesis.

II. ICT ASSESSMENT APPLICATIONS FOR HA/DR

The integrative nature of communication systems used by first responders in any disaster situation has a deterministic influence on the outcomes of their efforts. The need for the use of a platform-based information sharing tool with high compatibility is essential to the ability of the first responders to organize and strategize the assessment, search, rescue, and rebuilding of the affected areas. Recent innovations in mobile technology have produced smartphones and tablets, which have become pervasive computing and communications technologies that are flexible due to their high rate of compatibility among most technological applications (Chaudhri et al., 2012). This section will discuss two prevalent first responder applications for HA/DR efforts, which are compatible with these common technologies: the Lighthouse program and a commercially available application not available for the U.S. Military, Field Information Support Tool (FIST).

A. LIGHTHOUSE APPLICATION

Lighthouse is an innovative technological mobile platform application designed for smart phones that is capable of quickly mapping terrestrial elements within a database. These elements consist of familial patterns, tribal associations, consumption of basic necessities, customs, and numerous other attributes (Longley, 2012). The purpose of the software is to provide a stable network system that can be spontaneously created for use in HA/DR situations, which will be easily accessible to new responders and will permit the speedy dissemination of crucial information. The Lighthouse system is intended to help support HA/DR readiness for local communities as well as healthcare organizations and other emergency response organizations in all areas of emergency management, which includes prevention, protection, response, and recovery (Longley, 2012). Progression of the use of Lighthouse technologies in HA/DR situations is encouraged through capabilities-based training, planning, exercises, and testing (Longley, 2012). The application was field tested during the 2013 Crimson Viper Exercise by connecting to an ad-hoc HFN. The testing demonstrated the capabilities of the application

while opening up more possibilities of its use within the confines of an HFN during HA/DR.

The primary application associated with the Lighthouse program is the Open Data Kit (ODK), which is a robust open-source software suite that enables the customization of forms that can be easily and rapidly deployed to field respondents to enable secure access of complete reports that are securely stored in the cloud (Naval Postgraduate School, 2013). While all end users do not use ODK as the primary platform within Lighthouse, ODK has been used in previous versions since it offers a free, open-source collection of tools that can aid organizations in the authoring, fielding, and management of mobile data collection solutions (Longley, 2012). End users are able to customize ODK because it provides a simple solution for users to:

Customize data assembly forms for large and small collection;

Use a mobile device to collect and send the data to a server; and

Organize the data collected on a server for easy extrication to useful formats (Longley, 2012).

The ability to construct detailed forms unique to each situation enables HA/DR first responders to ensure that vital details are correctly and comprehensively documented and disseminated to all other aid groups, enabling proper management and crisis resolution. Figure 1 is the data entry forms.

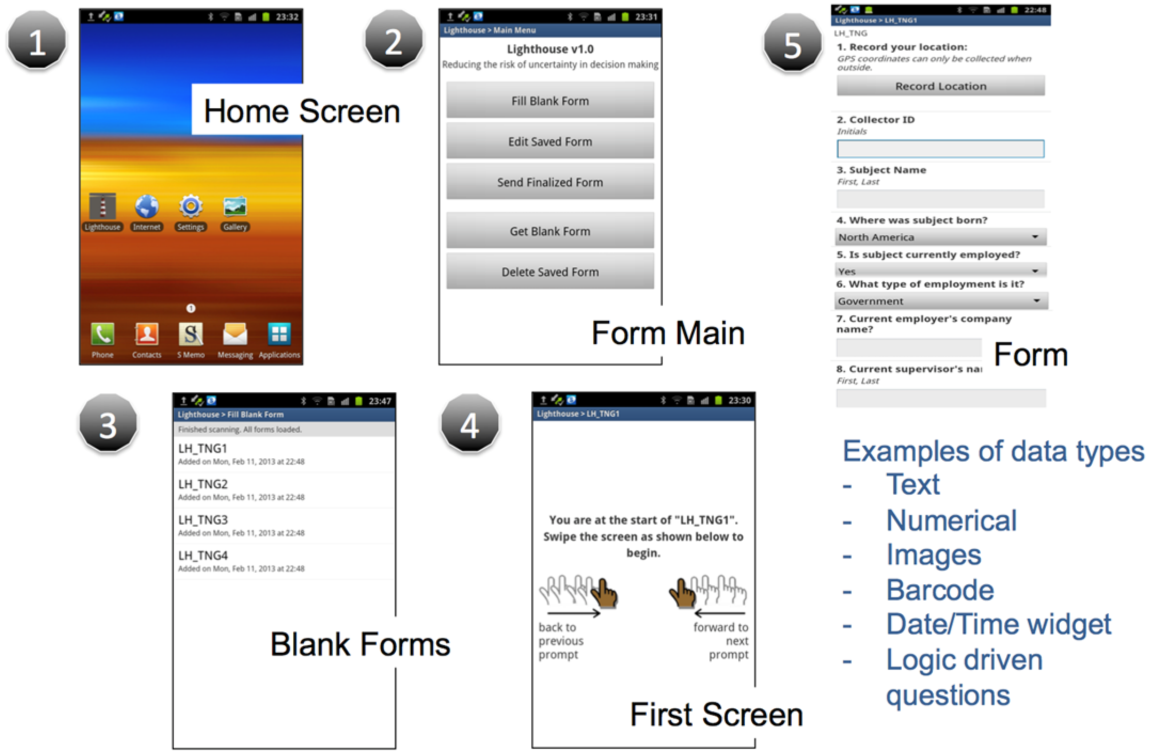

Figure 1. Lighthouse Application Mobile Screens

1. Concept of Lighthouse

The program has two formats, Lighthouse and Lighthouse ODK Collect, the latter of which is an Android-based form processing application that allows mobile data assemblage in harsh environments (Naval Postgraduate School, 2013). Lighthouse ODK Collect allows for reports rich in media content to be field collected and shared. The application permits the users to collect geospatial coordinates, audio, video, photographs, and any assortment of structured types of data (Krott, Morales, & Livingston, 2011). The broad compatibility of the software enables users to have various devices and still be able to easily receive, collect, and share data in the same format.

The Lighthouse software can be run on tablets running Froyo (2.2) and Ice Cream Sandwich as well as Android phones running 2.2+ (Longley, 2012). However, Lighthouse (ODK) can be run on any Android smartphones the Unlocked GSM International Version that runs Ice Cream Sandwich OS; the Samsung Galaxy SII (i9100) if it is the Unlocked GSM International Version that runs Gingerbread 2.3.4 OS; the

Samsung Nexus S if it is the Unlocked GSM International Version that runs Gingerbread 2.3.4 / ICS 4.0; and the HTC Nexus One if it is the Unlocked GSM International Version that runs Gingerbread 2.3.4 OS (Naval Postgraduate School, 2013). Likewise he software can also be run on tablets, including the Samsung Galaxy Tab 7″ version if it is the Unlocked 3G + Wi-Fi GSM tablet that is running Froyo 2.2 OS, not the 7+; BLU Touch book 7″ GSM and Wi-Fi tablet if it is running Froyo 2.2 and Apple iOS devices running Zerion only, which includes the iPhone 4S if it is the Unlocked GSM International Version; the iPhone 4 if it is the Unlocked GSM International Version; the iPod Touch 4th Generation that requires GPS dongle for location awareness; and the iPad 2 Wi-Fi + 3G GSM (Longley, Open Data Kit: An open-source data collection suite for Android, 2012).

While not comprehensive, the list includes the most popular devices that are seamlessly compatible with the Lighthouse or Lighthouse ODK Collect applications and have been useful for HA/DR first responders. Although public safety begins locally with detailed emergency contingency plans, it is also essential to use the most modern technological available to ensure that each situation is managed in a manner that ensures the highest possible preservation of life and property. The use of ODK Tables is a component of the Open Data Kit that provides a way of organizing data into database tables hosted directly by a smartphone. This makes it possible for users to make new entries into the tables and make queries regarding existing data entered into the system under an extensible access control model (Hong, Worden, & Borriello, 2011). ODK Tables are also supported by SMS-based interactions that allow the import/export of data to other storage devices, whether they are hosted in the cloud or on another local computing device (Hong, Worden, & Borriello, 2011).

2. Lighthouse Functionality in HA/DR

In disaster recovery, success often hinges on how well organizations have established and exercised continuity of operations plan (COOP). Proper execution indicates that the staff has learned in advance how to function in the midst of chaos otherwise; sometimes the organization itself can become the emergency. It could be

severe weather that knocks down part of the building, a public health crisis, or even an outbreak of violence. Knowing how to operate during the emergency can become the critical difference in survival for both the staff and the organization itself.

The Lighthouse application can provide three critical tools to responders that they can use before making any decisions on executable actions. These tools involve a social network, geospatial data, and temporal information. The social network component is a crucial component when it comes to the communication and social aspect of the area of responsibility (AOR) for the first responder. It could communicate the ICT capabilities, current structure, and real-time analysis of the AOR for the responder. The geospatial element provides an analysis or assessment of the physical terrain in the responders respective AOR, and can provide a sort of intelligence of the land situation. The third element Lighthouse addresses is temporal data. This tool can provide trend analysis showing networks as a function of time, helping the responder manage ICT expectations and capability. Examples of these tools used on the Lighthouse application are shown in Figure 2.

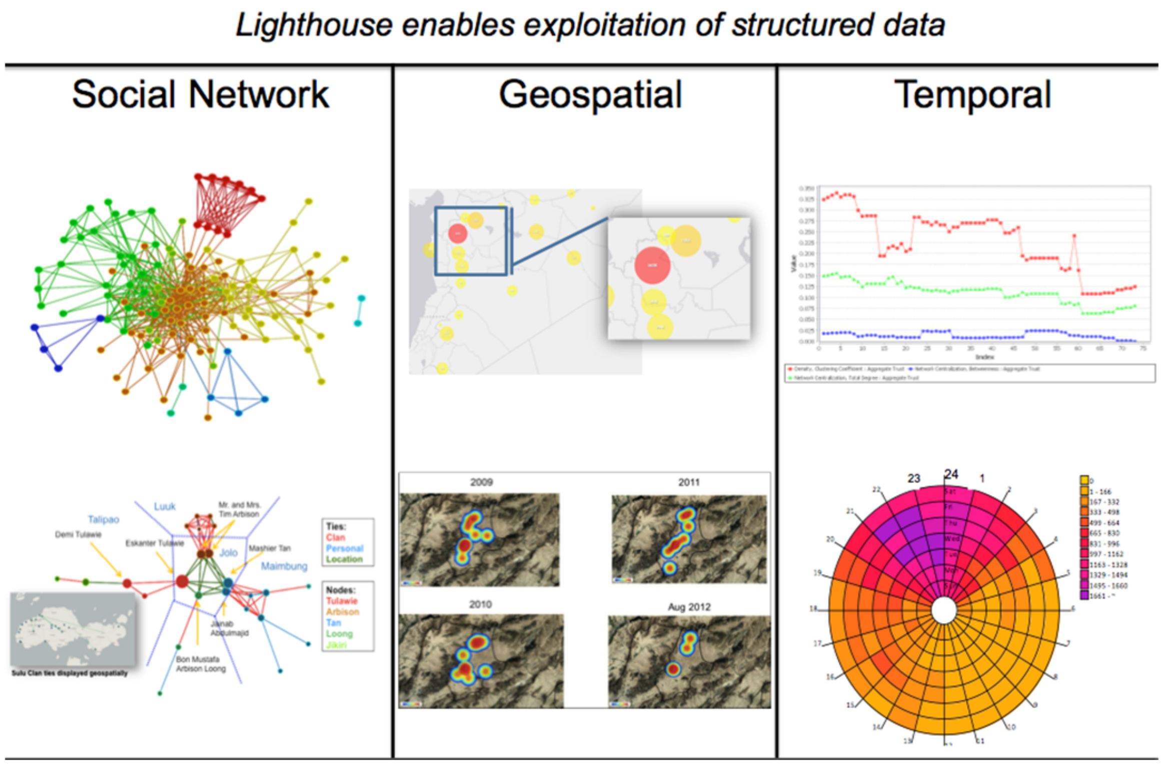

Figure 2. Lighthouse Examples of Structured Data

Lighthouse ODK software is also used for socio-economic or healthcare surveys that include Global Positioning Satellite (GPS) locations as well as images to create support decision for clinicians and build nature mapping instruments that are also multimedia-rich. The software is available with numerous additional tools, featured deployments, and commercial products compatible with Lighthouse or Lighthouse ODK. Public safety begins at the local level with well-conceived plans for major emergency events. Lighthouse Readiness Group is a team dedicated to making sure their clients are the best prepared in their industry for emergency situations.

3. Benefits of the Application

Lighthouse is available as either an Android or Apple implementation and provides the ability to collect field data using mobile devices into forms that are customizable to meet the needs of any emergency management agency. This only covers the (no-cost) Android version of the Lighthouse application. The Apple version is a commercial (for fee) application. Lighthouse also provides a back-end database that

allows for the analysis, display, and dissemination of this field data using an interactive web client. The NPS/RSC earthquake response project used Lighthouse to develop and demonstrate customized damage assessment forms for use within the project three-tier framework.

Responders enter data into simple forms and have the capability to transmit the forms along with supporting photos, video, and audio back to the Emergency Operations Center (EOC) if Internet or cell phones connections are available. If a Tier-3 situation exists (no Internet, no communications, and limited power), then the devices can download the data later when these are restored, or can locally download data at the EOC site to the common operating picture. The playbook directory near the end of this document shows the NPS earthquake response playbook sequence to help put this Playbook into perspective and give an overview of products resulting from this research and some aspects of practical implementation.

B. FIELD INFORMATION SUPPORT TOOL (FIST)

In any HA/DR campaign, knowledge sharing (KS) and knowledge management (KM) are essential to the ability of the relief effort to coordinate their strategies. The Field Information Support Tool (FIST) is an application that provides field-based data collection using commercial off-the-shelf (COTS) smartphones in conjunction with customized software (Gite, Dharmadhikari, & Ram, 2012). FIST also uses *Fusion Portal*, which is a robust, backend information management system equipped with a deployable fusion sensor system called *Fusion View* (Longley, 2010). This enables easy transfer of amassed information, regardless of physical location or proximity, from the point where the data was initially captured to analysts, nearly in real-time (Cardenas, n.d.). Figure 3 displays a data input form for the FIST application.

Figure 3. Mobile Display of FIST

1. Concept of FIST

The FIST application was created to function in numerous diverse environments to support various possible missions, such as counter-narcotics (CN), counterinsurgency operations (COIN), and HA/DR efforts (Gite, Dharmadhikari, & Ram, 2012). The central theme of FIST is the construct of a user-friendly information gathering instrument that encompasses computerized information systems capable of collecting, processing, and structuring the data for visualization and analysis in differing analytic packages (Longley, 2010). FIST was created as a comprehensive and global solution to address three common problems in the field of knowledge creation and information sharing:

- The ability to gather data has outpaced our ability to create knowledge through visualization;
- The ability to aggregate open source data with existing information management systems via cross-domain solutions is limited; and
- The ability to share data and information is restricted, impeding organizations with different cultures and missions that need to view places, events, and the human terrain from a common perspective.

Figure 4 is an illustration of the inter-agency information fusion, analysis and dissemination process.

Figure 4. Inter-Agency Information Fusion, Analysis and Dissemination

Using geospatial, temporal, social network, and link analysis tools and techniques, FIST enables a continuous cycle of actionable information creation. This information, combined with effective visualization, categorization, filtering, and analysis, provides the HA/DR personnel making decisions updated and current information that is sharable throughout the duration of an operation. The FIST application consists of two separate

components that work collaboratively to comprise the system. The tool for the collection of field data is a smartphone application called *Gather*. The second function is called *Fusion Portal*, a web-based portal for information management analysis, visualization, and sensor fusion of assembled information (Ehlert, n.d.). The application allows field data to be captured using smartphones, laptops or a diverse array of user interfaces in the gathering process and transmitted via the cellular infrastructure over Wi-Fi connections or locally stored to be uploaded to a web-based server system, called the *Fusion Portal* at a later time (Longley, 2010). Examples of fusion portal data entry forms are displayed in Figure 5.

Figure 5. Fusion Portal Data Entry Forms

The *Fusion Portal* also allows the exchange of information over external databases, such as the International Studies of Violent Groups (ISVG), the Combined Information Data Network Exchange (CIDNE), and the Worldwide Civil Information Database (WCID) (Longley, 2010). This enables the dissemination and importation of enterprise data and streaming media that is amassed from the Internet (Cardenas, n.d.). System resource requirements for web access are basic, and since the FIST gather application is hardware agnostic, it is compatible with any computer or android smart

device, which can be used for data entry/analysis, and web accessible, system resource requirements are basic (Cardenas, n.d.).

The *Fusion View* function enables the immediate integration of dissimilar sensor systems that delivers a powerful mutual operating picture vital to modern decision makers (Cardenas, n.d.). A screenshot of *Fusion View* using UAV tracks is shown in Figure 6.

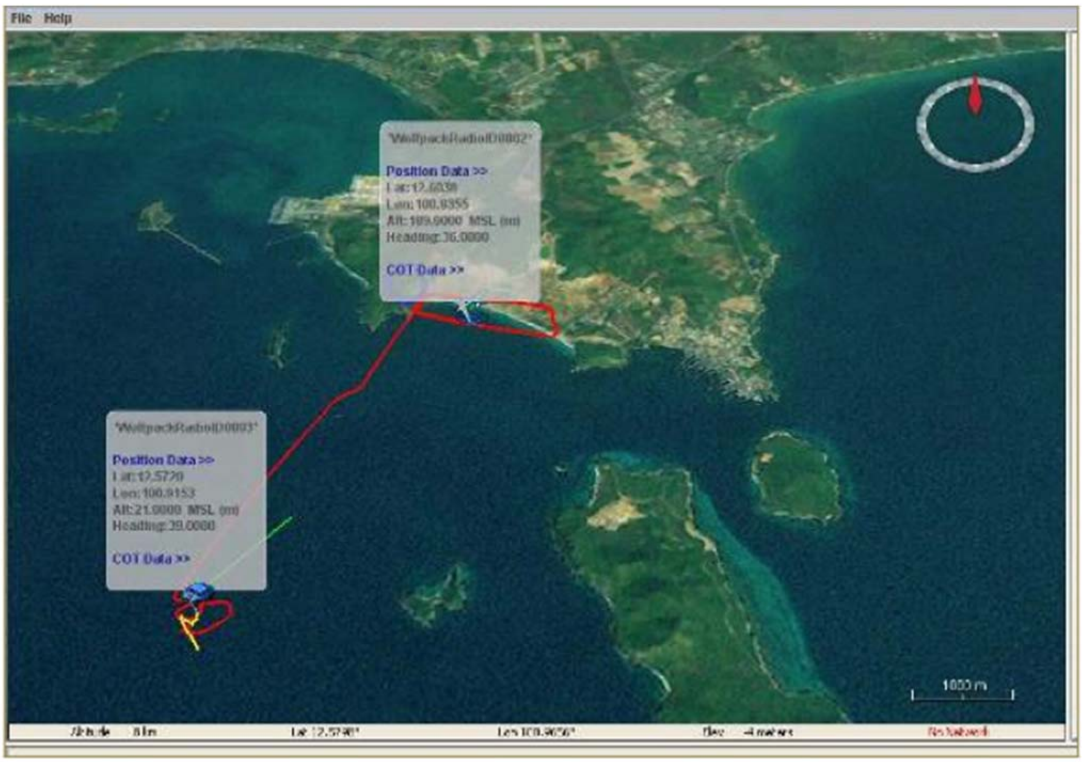

Figure 6. Fusion View Screenshot Using UAV Tracks

2. Using FIST for HA/DR

In any HA/DR situation the responders are faced with an immediate challenge to gather and disseminate data in real time. Complications gathering and visualizing information are typically caused by connectivity-related issues, which are common in post-disaster environments. These connectivity problems have been the greatest hindrance in past disaster response situations because they interfere with coordination efforts. These situations are likely to continue to present an obstacle in future disaster

response efforts without a stable universal information portal. FIST, combined with a HFN, provides a means to close the communications gap in these situations.

The FIST system mitigates limitations with several innovative solutions to include cutting-edge cellular data transfer methods, storage and forwarding capabilities, SMS reporting, and communication interoperability over satellite/radio/Wi-Fi networks (Cardenas, n.d.). The program operates on a cyclical six-phase information-processing format as in Figure 7, which shows how the process begins with planning.

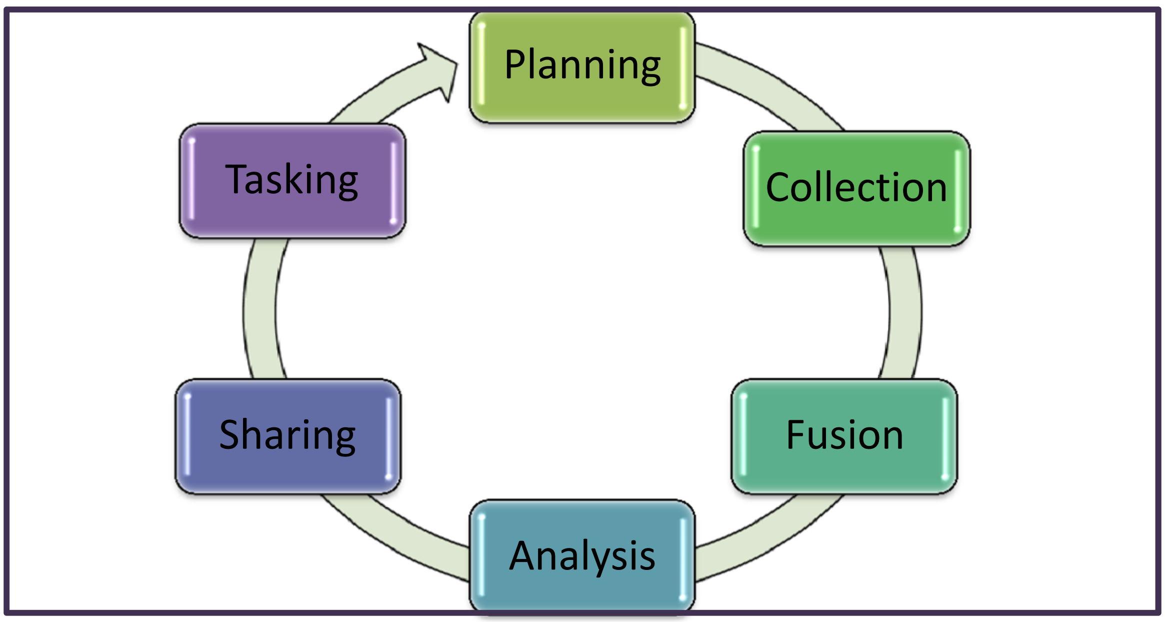

Figure 7. FIST Cycle of Data Management

Following a disaster event, the public can serve as crucial asset in regards to the dissemination or provisioning of information. FIST can assist here by providing crowd-sourcing applications for iPhone and Android (Sigholm, n.d.). This facilitates public information flows to planners as they work to implement an effective response.

3. Benefits of the Application

FIST allows for modeling of various dynamics, including disease tracking, and a custom form can be fashioned to collect relevant information regarding disease outbreaks

and symptoms (Longley, 2010). This enables researchers to determine the causation patterns in disease transmission media, and provide this information to health care professionals in a timely fashion so they can develop a comprehensive understanding of each unique situation. The FIST team is constantly working with international engagement communities to survey and manage information while facilitating the future integration of data gathering (Cardenas, n.d.). By switching to an automated data gathering, dissemination, archiving, and visualization system, organizations can greatly reduce the time, resources, and errors associated with conventional data gathering and analysis. FIST's web-based segmented data housing design ensures efficient and controlled data sharing with partner organizations (Gite, Dharmadhikari, & Ram, 2012).

In the disease-mapping portal, a geospatial view of the affected areas can be pushed directly to the responder for analysis. The data can be viewed over time a geospatial view in order to highlight temporal trends, allowing the command and control element to quickly understand the relationship between multiple events and effect action, as displayed in Figure 8 (FIST, 2012).

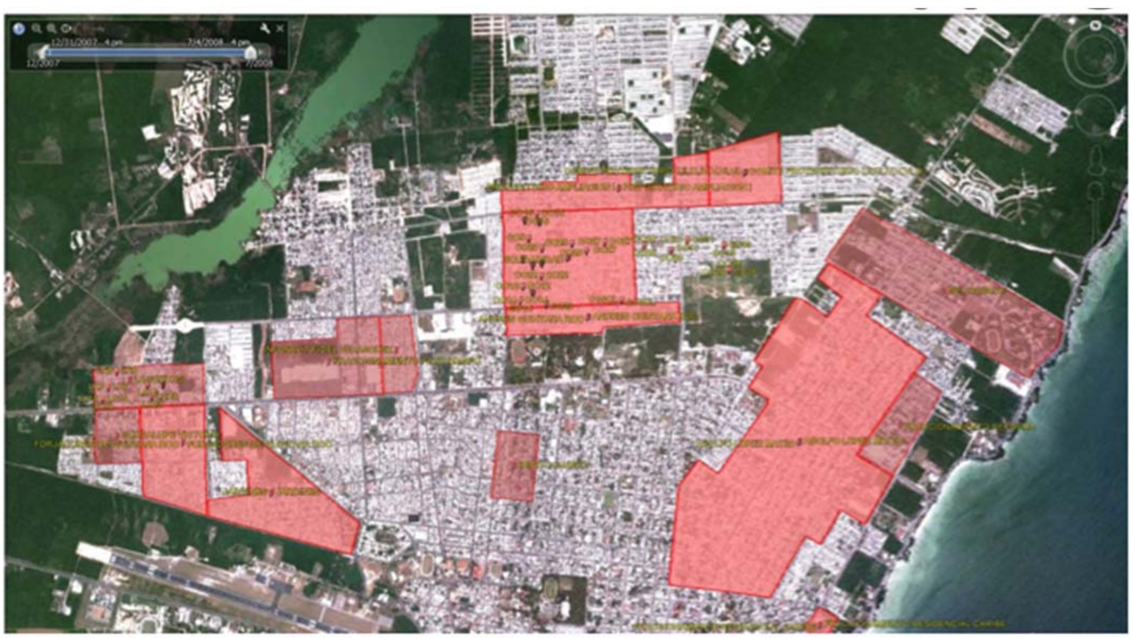

Figure 8. FIST Disease Mapping

The FIST system also integrates disparate sensor systems to support an integrated common operating picture (COP) for users in other fields, such as law enforcement. The integrated solution deploys applications that seamlessly leverage the most effective data management tools. Biometric reporting provides rapid fusion and analysis of humans to vehicle movements and other activity patterns to create actionable intelligence as well as support acute response operations (Cardenas, n.d.). The sensor fusion capabilities for FIST are broad and can include unmanned systems, sensor arrays, and other technologies that aid in HA/DR (Cardenas, n.d.).

A primary purpose of FIST is to use a structured platform that is highly flexible and compatible with a wide range of programs to record field data (Sigholm, n.d.). The *Gather* function is designed to be a processing engine that is form based for the easy organization of recorded data (Ehlert, n.d.). The forms are up or downloaded directly to *Fusion Portal*, which is the forms manager, through a network connection so the information can be updated at any imminent point in real-time (Longley, 2010). The forms have packs that support multiple dialects so HA/DR responders can offer the questions in any language over a dynamic streamlined environment for validation of data entry, and permits the operator to collect details using diverse multimedia formats that can be connected to the reports, including geographical coordinates, voice or video recordings, and photographs (Ehlert, n.d.). Figure 9 is an example of FIST's capability to map crisis. The figure shows how regions can be color-coded and correspond to a legend for easy comprehension of the responder.

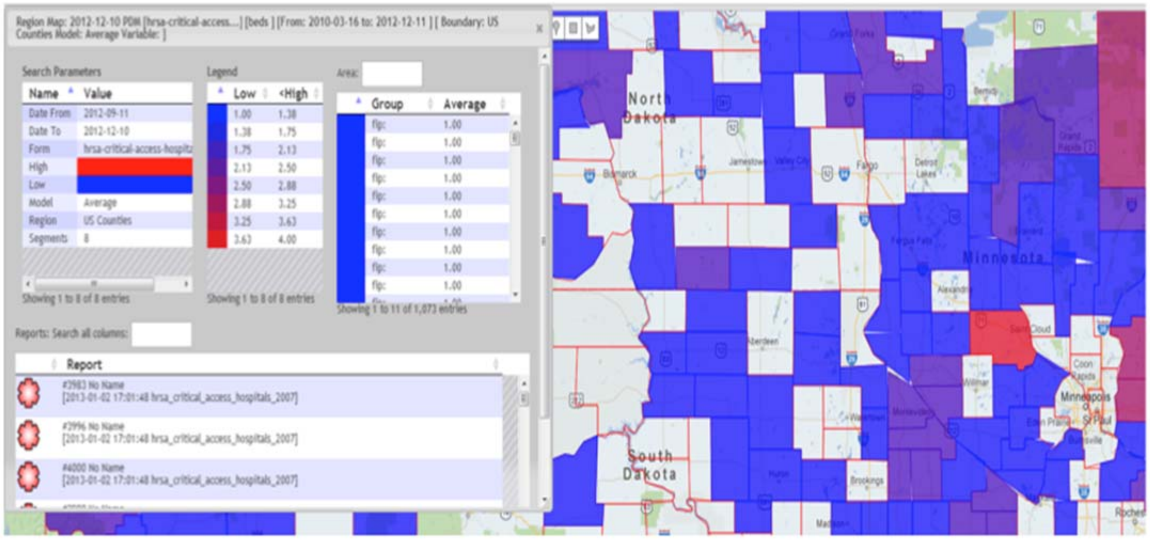

Figure 9. FIST Crisis Mapping

With FIST's multi-source visualization tool, all inputs are combined to feed the COP. It combines data from sensors, tweets, and RSS feeds into a sharable COP. Figure 10 is an example of the multi-source visualization tool. The image displays in the upper left shows an example report with media and report alarms. The upper right shows overlays imported into the portal showing flooding (blue), road blockages, and damaged bridges. The lower left is an overlay with IDP camp locations. Finally on the lower right, multiple reports are listed that are shown on the geo-located map (FIST, 2010).

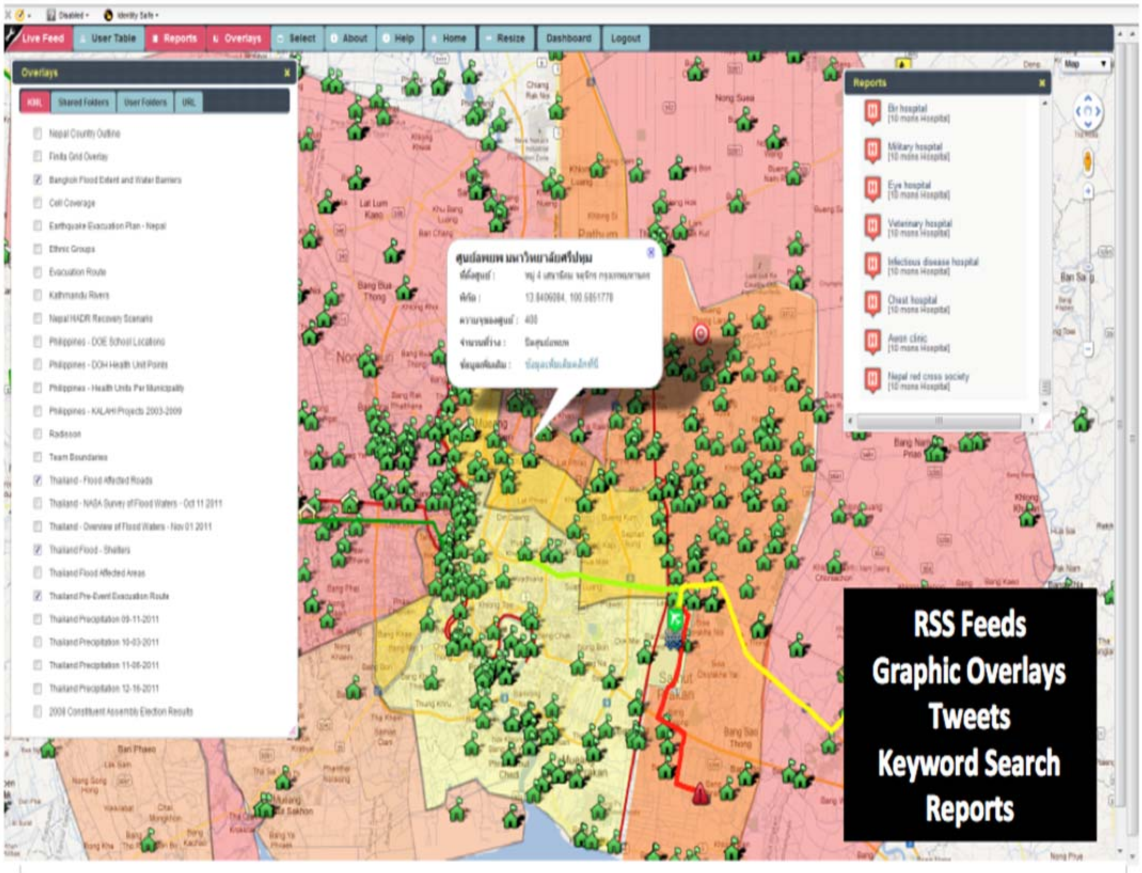

Figure 10. FIST Multi-Source Visualization

An additional benefit of the FIST application's customizable format is that it permits the system to be upgraded to enable the use of additional devices, such as external Bluetooth devices not included in the initial FIST specification, including a fingerprint scanner. The availability of local databases on simple phones enables users to save the collection reports that are awaiting transmittal while also storing collection reports that were previously uploaded to *Fusion Portal* (Sigholm, n.d.). Using this format allows *Gather* to work offline and still providing the user with an information rich environment (Cardenas, n.d.). Additionally, the *Gather–Fusion Portal* user interface allows the dissemination of information to smart phones, users can update forms and collection reports instantly, and control is enabled based on account details associated with the organization's *Fusion Portal* account (Ehlert, n.d.).

The KS/KM capabilities afforded through use of the *Fusion Portal* provides data analysis, geospatial and report based consolidation, visualization, and KS/KM via interactive user displays (Ehlert, n.d.). These four experiences form the basis of the information management strategy provided by the FIST interface. This application allows any HA/DR users to receive field data input and amalgamate the information into a collaborative view that can be analyzed and shared (Gite, Dharmadhikari, & Ram, 2012). The transformation of raw data resulting from the enabling of KS/KM is useful to an analyst, a consumer, or decision maker (Ehlert, n.d.). The general advantages of FIST are the following:

- Partner nation friendly
- Exportable
- Architecture, use, and form factor is simple
- Users own their data (can put FIST server anywhere)
- Multi-lingual
- Sensor fusion
- Multi-platform (Android; iPhone in beta test)
- Low footprint
- Low cost satellite burst protocol option (works everywhere)
- Performs in all environments (no G, 1G or 2G environments)
- Real-time two-way tasking
- Robust data ingest and export data
- Analysis force multiplier; reduce time & expertise to create knowledge
- Complements existing first responder systems; potential for a shared COP

Aside from the HA/DR capabilities discussed in this chapter, FIST also can be applied to other mission areas. In general, FIST is a situational awareness enhancer that can significantly reduce the time and expertise required of the user. It creates a shared resource that allows users to connect and act upon shared knowledge.

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III. THE HASTILY FORMED NETWORK

A. VALUE OF THE NETWORK

Upon arrival to the scene of an HA/DR mission, the likelihood of finding a functioning communications infrastructure is very low. Without information sharing there can be no coordination; if we are not talking to each other and sharing information, then we go back 30 years (Foundation & Vodafone Foundation Technology Partnership, 2011). In order for mobile devices to work along with their applications, there must be a means of connection. The tools discussed in this thesis, Lighthouse and FIST, provide real time or near real time situation updates and data essential to the mission of HA/DR. In order for this technology to work in a disaster region where the communication infrastructure has been destroyed, HFNs must be deployed to set up a wide area network in which information can be shared between operators. The use of HFN technology will improve interagency information sharing, interoperability, command and control, and coordination among responders during HA/DR missions by providing the conversation space for applicable mobile applications.

The necessity of HFNs stems from recent experiences across the lines of military and non-governmental organizations (NGOs) involved in HA/DR missions around the globe. In order to pass critical information such as chat, pictures, video, medical reports, etc., amongst agencies, there needs to be an established network that can be constructed quickly and effectively so responders can communicate. The need for this technology was exploited in the wake of the earthquake and tsunami that ravaged Indonesia, Thailand, and other South Asian countries on December 26, 2004. Reporter Bob Brewin recorded the following from Colonel Monti (Colonel, III MEF, USMC):

> What he lacked, Monti said, was an unclassified network that could also be accessed by military personnel from Thailand, Indonesia, Australia and other countries, as well as representatives from the United Nations, other NGOs and U.S. civilian agencies, such as the U.S. Agency for International Development (USAID). (Brewin, 2005)

The first priority after the precipitating event is for the responders to communicate. They want to pool their knowledge and interpretations of the situation,

understand what resources are available, assess options, plan responses, decide, commit, act, and coordinate (Denning, 2006). Without communication, none of these things happens: the responders cannot respond. Thus the heart of the network is the communication system they use and the ways they interact within it. We call this the "conversation space" of the HFN (Denning, 2006).

B. HFN DEFINED

The idea of the HFN stemmed from the need to share information between devices on the fly when there is no established network. The HFN setup discussed in this thesis is an unclassified networked connection with low-level security settings for general access among participating organizations. It is based on an Internet Protocol (IP) infrastructure. In the Internet protocol suite, IP resides on the network layer of the Open Systems Interconnection (OSI) model. A HFN provides the basic requirements to network multiple devices and connect them to the Internet. The hardware used to build the HFN consists of small, mobile and easily set up equipment for the user.

> Hastily formed networks (HFNs) are portable IP-based networks that are deployed in the immediate aftermath of a disaster, when normal communications infrastructure has been degraded or destroyed. Since HFNs create new communications infrastructure, they can be very valuable in providing basic communications (voice/video/data) until pre-disaster infrastructure can be restored. HFNs are a particularly effective implementation of information and communication technology (ICT), enabling the crisis communications necessary for a rapid, efficient, humanitarian response. (Nelson, Steckler, Stamberger, 2011)

Overall, the HFN needs to be able to handle multiple connection types and have sufficient range.

C. HFN COMPONENTS

There are four main components of an HFN. These components are the communications station providing Internet services, a satellite for reach-back to the Internet, a fly-away-kit (FLAK), and a last mile connection (LMC) for displaced units. HFNs can be put together using a suite of commercial off-the-shelf (COTS) wireless gear, such as broadband global-area network (BGAN) satellite communications devices,

wireless fidelity (Wi-Fi) and WiMAX devices. The equipment is designed to be easy to use and portable. These characteristics are essential to make HFNs suitable for deployment in disasters since the required expertise to set up complicated equipment and road infrastructure to transport large bulky equipment may not be available.

HFNs are typically made up of a few fly-away kits that are taken by teams via air or ground transportation. The central location of the HFN is initially set up followed by nodes that are interconnected to make up the network. The central location provides the initial connection to the Internet Protocol (IP) backbone (via satellite) and is more robust than the nodes that branch out to create a larger footprint. However, the nodes should have most if not all the same capabilities as the central location. The network nodes can be connected via tools such as WiMAX antennas and receivers and can be monitored by a network management tool (Steckler, 2012). A central location will be the central gateway to the Internet and will establish connectivity via satellite terminals such as Very Small Aperture Terminals (VSATs) or Broadband Global Area Networks (BGANs). Each location has a wireless access points to broadcast to users within their area of responsibility (AOR). Figure 11 shows a basic scheme of components of a HFN.

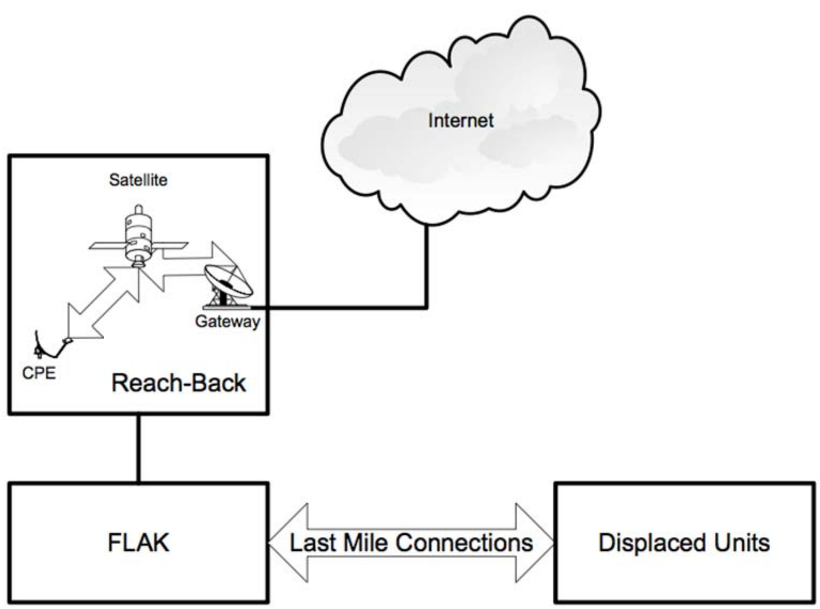

Figure 11. Basic HFN Components

a. Meshed Wi-Fi/Wave Relay

The IEEE 802.11 standard is used to connect to the Internet via mobile devices within a network. Each of these devices provides a Wi-Fi cloud in their immediate vicinity to give a responder the ability to connect to the network and Internet. Each Wi-Fi device is considered a part of the mesh because it can serve a series of clients, routers and gateways. The devices used subscribe to the 802.11n/b/g standards.

b. Satellite Communications (SATCOM)

Satellite communications (SATCOM) allows data transfer anywhere the satellite and receiving device can cover. It can be used for temporary ad-hoc network connections such as a HFN. The temporary infrastructure provides Internet as well as secure virtual private network (VPN) data, voice, and video services and can remain in place for days or weeks, as the situation requires (Viasat, 2012).

SATCOM is can be used on the go and can be accessed fairly quickly as long as there is satellite coverage. The broadband global area network BGAN satellite access device is an option that works well within a HFN. The actual device is about the size of a standard suitcase and can connect to a satellite within minutes. This device is essentially the gateway to the Internet for the HFN. BGAN operates in the L band and can provide up to 492kbps of data. Depending on the BGAN device used, it can also provide phone services such as voice calls, voice-mail, and other standard 3G supplemental services. Figure 12 is a photograph of a BGAN in it protective case.

Figure 12. BGAN in Hardened Case

VSAT is a commercially available product that can be used in the construction of a HFN. VSAT generally has more throughput than BGAN, provides a faster uplink/downlink speed, allows for more users, and provides less latency for connected applications. For FIST and Lighthouse, more throughput is a plus because response time and time delay of data could be critical. VSATs are also able to use more than one radio band in order to connect to different satellites (Ka, Ku, X, and C bands). This adds flexibility to the users of the associated HFN. Figure 13 is a photograph of a VSAT in use.

Figure 13. ViaSat Surfbean 2 Pro Portable VSAT

c. WiMAX

Worldwide Interoperability for Microwave Access (WiMAX) is the IEEE 802.16 wireless created by the companies Intel and Alvarion in 2002 and ratified by the IEEE (Institute of Electrical and Electronics Engineers). WiMAX is the commercial designation that the WiMAX Forum designates to devices that conform to the IEEE 802.16 standard, in order to ensure a high level of interoperability among the devices. WiMAX is a key component in the HFN because it provides the LMC connection to the responder who is not necessarily close to the local HFN.

Once the HFN is established, it can then be connected to a series of "wireless clouds" that could stretch great distances over disaster regions. Figure 14 shows how a HFN could be connected, while providing a live-networked link for responders. The red dashed lines depict the signal to and from a satellite to the receiving nodes to provide the Internet connection. The blue circles represent the individual HFN's, which can share their connection to the satellite by means of WiMAX links.

d. Power Supply

The ability to find local and readily available power sources is always an issue in the wake of a disaster. The need for expeditionary power is an essential part of establishing the HFN. Solar panels with compatible connections are preferred for the HFN and were the primary source (with batteries) used to power all equipment used, tested, and demonstrated in the evaluation of the technology discussed in this thesis. Solar panels can be broken down, folded and prepared for easy transport and storage quickly and easily by a single person. Figure 14 is a photo of solar panels used to power HFN. Power generators are also a good source, but are limited.

Figure 14. Solar Panels Used to Power an HFN

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IV. OPERATIONAL TESTING AND IMPLEMENTATION

A. CRIMSON VIPER 2013

The NPS's HFN research group has developed a HFN FLAK to support research and testing of the technology. The FLAK was demonstrated and tested along with the Lighthouse application during the Crimson Viper 2013 (CV13) exercise in Thailand. The HFN was set up at the Yao observation tower and along the coast near the town of Sattahip, Thailand primarily working at the Hat Yao beach. Figure 14 is an image of the CV13 location at Hat Yao Beach, Thailand.

Figure 15. Crimson Viper AOR

The goal of the NPS HFN group was to demonstrate the capabilities of an HFN along with the Lighthouse application for potential uses during disaster ICT assessments. The group demonstrated a suite of small form factor flexible communications for command and control equipment that can readily be deployed in support of HA/DR operations. Our FLAK consisted of meshed Wi-Fi equipment, WiMAX, VSAT, BGAN, and alternate power sources. The capabilities displayed were:

- Broadband Internet access in austere environments where infrastructure has been damaged or destroyed
- Voice, video and data communications capability for early responders (UN, NGO, military, government, industry)
- Command/control network for a joint task force emergency operations center
- Quick disaster assessment

For a period of 10 days, the team constructed their HFN each morning, establishing a successful connection that formed a network that could be accessed by authorized users. The connection used a BGAN to attain the satellite connection. The BGAN was also connected to a WiMAX device, which sent the signal to the WiMAX device situated approximately 2000 yards away on the beach. Each WiMAX device provided a connection to a mesh wave relay device that provided a Wi-Fi coverage area around each node. With this setup, the team successfully extended their Wi-Fi cloud and used our mobile devices further down the beach while testing Lighthouse. By extending the coverage area of the network connection, the team was able to communicate and share information beyond the expected range, which proved to be important when doing the initial survey of a disaster area. The HFN was not only used by the NPS HFN group, but also all participants of CV13 that were inside the HFNs umbrella. Figure 15 is a photo taken of the gear used to set up the HFN for CV13.

Figure 16. Crimson Viper 2013 HFN Gear

The Lighthouse application was tested and demonstrated by the members of the NPS HFN group only. The group used the application within the confines of the HFN that had been established. Using three separate mobile devices with Lighthouse installed in them, the NPS HFN group established a simulated RTAT and began making ground level assessments and entering them into the Lighthouse database. The team was successfully able to remotely share information and send feedback to the control unit. Information was able to be immediately updated and forwarded to all intended recipients. The overall results of the HFN and Lighthouse demonstration proved to be successful and ready for further testing.

An additional use for the combination of the HFN and Lighthouse application was explored which involved the knowledge sharing of known improvised explosive devices. This could also play a factor in disaster relief missions in hazardous areas that contain hazardous munitions such as mines and IED's. This side of the technology needs to be explored in future research outside the scope of this thesis.

B. OPERATION DAMAYAN (RESPONSE TO TYPHOON HAIYAN)

On November 8, 2013 a powerful typhoon devastated the Philippines. It was the most powerful typhoon in recorded history. The storm ravaged a huge area rendering much of the ICT in the region inoperable. The storm made landfall at speeds of 196 mph and affected nearly 11 million people. Multiple U.S. military units, NGOs, NPS HFN center personnel and many other organizations were deployed to the region to carry out the HA/DR mission called Operation Damayan. The NPS HFN center was directed by Marine Corps Forces Pacific (MARFORPAC) to assist the 3rd Marine Expeditionary Brigade who were forward deployed in the disaster zone. Figure 16 is one of many destroyed cellular relay towers that were a casualty of the storm.

Figure 17. Destroyed Cellular Tower Near Tacloban City, Philippines.

The NPS HFN group deployed a six-man team to assist with expeditionary communications and technology assessments. The expectations of the HFN group were to deploy Internet enabled communications in an austere environment at a moment's notice. The HFN group established a RTAT to do actual operational assessments of the ICT throughout the region. The HFN group brought their FLAK, equipped with BGAN, WiMAX and meshed Wi-Fi gear. The group also brought power solutions such as solar cells, fuel cells, and wind turbines as shown in Figure 18.

Figure 18. NPS HFN Group Gear for Operational Assistance

The combined RTAT put together by the NPS HFN group included The Armed Forces of the Philippines, Bicol University, the Philippine National Police, the Roddenberry Foundation, and Team Patola (a local non-government organization). The RTAT group used Lighthouse in concert with HFNs to provide information to each other, the host-nation and other relief agencies of the ICT in the area. The HFN was also able to provide on the spot equipment training to personnel who were to work with HFNs and Lighthouse. Among those trained were over 40 recruited volunteers. A PowerPoint® presentation used for training during the operation is located in the appendix of this thesis. During the operation, the RTAT team was successful in providing critical communications linkage between crisis response organizations in Cebu and Tacloban City, Philippines. The collected data loaded into the Lighthouse application was forwarded and displayed on the Pacific Disaster Center's DisasterAWARE website as displayed in Figure 19.

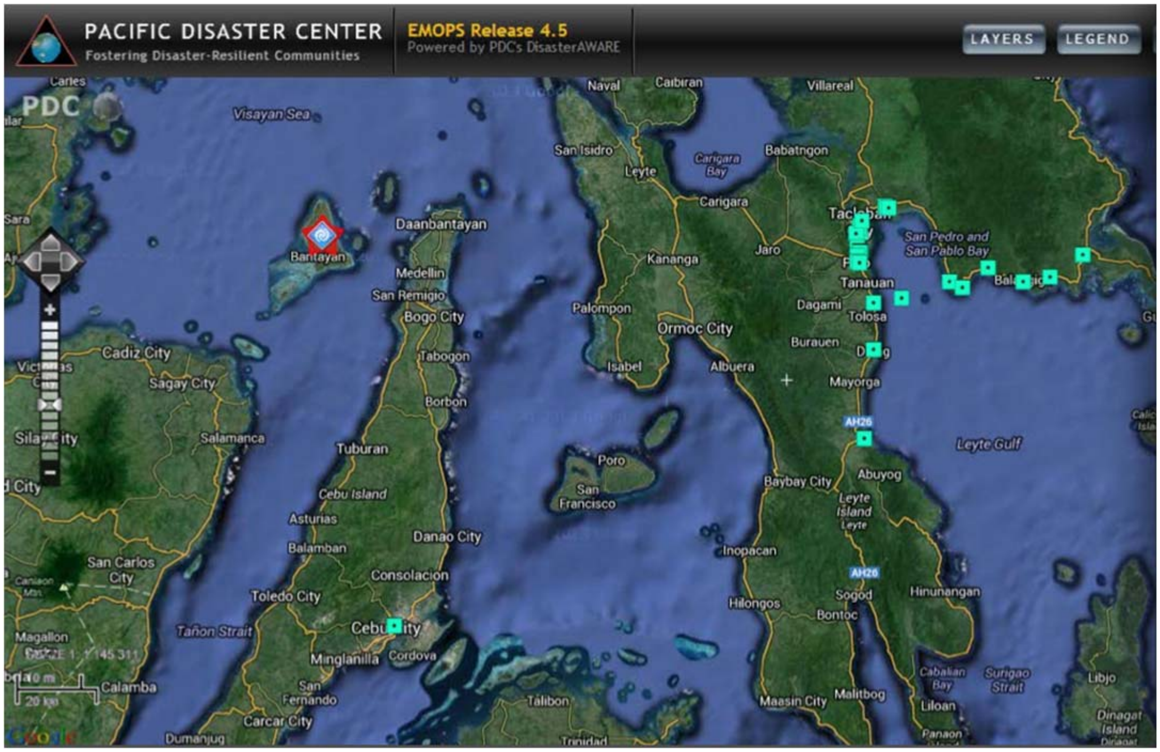

Figure 19. Lighthouse Data Inputs to Pacific Disaster Center Website

The overall outcome of the use of Lighthouse within a HFN during the NPS HFN group was a success. The technology proved to be of high value to responders and helped to paint an overall picture of the situation on the ground. There are several improvements necessary to Lighthouse as well as the implementation and use of HFNs that need to be explored in future research.

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V. FEASIBILITY AND MANAGEMENT CONSIDERATIONS

1. Exchange of Information

The use of HFNs that enable the use of mobile Applications discussed in this thesis provides first responders with comprehensive and enhanced capabilities to complete their tasks during a HA/DR mission. It allows responders to work together regardless of the agency by opening up a conversation space to share information. Research has identified the five essential characteristics of an efficient team, which are:

1. Precision in communicating the team goal and shared vision,
2. Identification of roles and specific responsibilities for members,
3. Understanding of the effects of goal orientation,
4. Complete cooperation for mutual assistance, and
5. High levels of creativity (Curry & Moore, 2003)

Meeting these standards mainly concerns the establishment of mutual goals and task distribution, all of which necessitate communication and sharing of information to provide an understanding of what the mission requires. Achieving a high degree of cooperation requires open, straightforward and timely communications, which necessitate the successful construct of an information network on a universally compatible application, such as the applications discussed in this thesis.

2. Lines of Communication

Ensuring that lines of communication remain open during times of disaster and the period in which endeavors are undertaken to restore the impacted community exponentially increases the likelihood that the undertakings will succeed in providing sufficient aid to the affected people (Drifmeyer & Llewellyn, 2003). There are three capabilities of information sharing that are required to help HA/DR campaigns attain desired outcomes, which are (Kanapeckiene, Kaklauskas, Zavadskas, & Seniut, 2010):

- Information behaviors and values
- Practices for information management (IM)
- Practices for information technology (IT)

Additionally, five information values and behaviors have been acknowledged that are understood to facilitate actions characterized as indicators of the development of information sharing within, which are (Marchand, Kettinger, & Rollins, 2001):

- Formality control
- Pro-activeness
- Transparency of information
- Information sharing and
- Integrity of information

These characteristics of information sharing ensure that the flow of knowledge is integrated and is controlled within the group, necessitating that such actions are only possible with proper consideration. Moreover, the quality of information must be accurate, available, reliable, and valid. The ability of the Lighthouse and FIST applications to be used with a variety of smartphones enables the HA/DR personnel to receive, store, and transmit vital information over a reliable, secure network. This enables individuals to streamline remote access, enhance security by restricting access to key administrative functions, and reduce server downtime. The anticipated benefits include access to IT tools and applications twice as fast, 20 percent faster completion of projects, reduced downtime, enhanced security, and the potential for integrated use of the tools in all HA/DR endeavors. These tools, such as Lighthouse and FIST, can be used with different computer equipment, applications, security, and networking protocols.

3. Enhance Response Time

The ability to plan a framework for the management of service and the increasingly complex information, communication, and control systems required to successfully implement an HA/DR strategy in which volunteers are able to quickly deploy additional workloads, application upgrades, and security updates provides significant benefits to the vast network of users (Drifmeyer & Llewellyn, 2003). These applications give IT a workable approach to optimizing without needing to customize on an individual user basis, which significantly reduces the amount of time spent attempting to gather and distribute information (Sigholm, n.d.). This means that HA/DR responders

can access the necessary information easily and integrate it into a mobile platform. The less time responders have to spend looking for information or trying to collaborate with supportive organizations, the better the outcomes are for the operation. Using applications such as Lighthouse or FIST, HA/DR personnel can access and share knowledge of the affected location before they arrive and will have access to information gathered and stored from previous experiences that can assist in formulating a responsive plan of action.

4. Cost- Relatively Low Compared to Other Technology

Flexibility in mobile applications provide HA/DR efforts the ability to improve application management by centralizing the datacenter to reduce costs, control and encrypt access to data and applications to improve security, and deliver data instantly to users anywhere so that they can integrate their tools and infrastructure to help control, measure, and monitor performance (Chan, 2012). Applications such as Lighthouse and FIST can be integrated into existing technology that the HA/DR personnel may already own; the associated costs are minimal for acquisition of the product. Also, since the central framework has already been established, all the associated users must do is learn how to use the application.

5. Application and Network Security Considerations

When data is collected and stored on mobile devices, the issue of ensuring that information is secure and can only be accessed by authorized individuals is a concern and factors into the feasibility of use of the application. WEP (Wired Equivalent Privacy) is an encryption algorithm incorporated in the 802.11b standards and is secure like a wired LAN, but still prone to passive attacks that can decrypt traffic using quantitative research and repetitive assaults, which could allow real-time automatic decryption of users based on the previous day’s breakdown of the site traffic (Hasan, Boostanimehr, & Bhargava, 2011). In securing the data stored in the Lighthouse and FIST applications, WEP is easy and relatively inexpensive to implement since it uses two straightforward security measures, which are the authentication phase and the communication under encryption phase. WEP is currently a mainstream protocol that will not exhaust a considerable

volume of control mainly due to the simplicity of the encryption design, as well as the mode for discovering offensives and mechanically snoozing. However, WEP does not offer a method to regulate corporeal locality, but this was the principle approach at a wireless security protocols. WEP algorithms implement a multitude of techniques, which includes:

- "2 party or 3 way handshakes"
- Single static pre-shared 40/104 bit key
- Challenge response authentication mechanism using shared key authentication
- Packet integrity check
- Initialization vector for creating freshness of encryption key
- Self-synchronizing
- RC4 Symmetric key cipher encryption algorithm" (Boudreau, et al., 2009)

As the technology is further explored and enhanced, future research is recommended on security management of HFN's and mobile applications.

6. Leakage of Classified Information

Part of network security entails ensuring that the Lighthouse and FIST applications are not vulnerable to leakage of classified information either from external attacks from hackers or inappropriate use of the applications. Although the strength of the network security can prevent or block access to information by external sources, the integrity of the personnel is the first consideration against misuse or leakage of secure data. To ensure data remains secure, users would be tasked with deleting irrelevant information from their devices during the development regarding operations. Users should be trained to develop an understanding of what type of data is considered classified or unclassified and whether or not it should be entered into an applications database. Furthermore, confidentiality agreements and restrictions delineating where information can be sent when using the applications would help provide supplementary assurance that the integrity of the information would be maintained.

7. Data Overflow

Data overflow occurs when there is too much data for the system of an application in use to handle. When this occurs the whole network can crash and make information unavailable to all users, which can severely impede the mission's efforts. Different data storage methods including data warehouses and data mining are intensively used because of their ability to increase the availability of information and also make it easy to manipulate it. Further research on this subject is necessary to prevent these types of issues.

8. Software Glitches

As with any piece of software, there may be glitches. It is highly likely that with every upgrade or introduction of a new application, there may be significant glitches or undetected bugs that can hinder or impede the use of the tools. Detection of these issues may come at an inopportune time and cause unavailability of the service, which is why an alternative data transfer tool should be on standby just in case the primary services are unavailable. When planning to use tools like Lighthouse or FIST, they should be rigorously tested during downtimes to ensure that the system will be able to handle the expected outage during times of crisis. Pre-testing the programs before critical use will permit the designers to find glitches and other anomalies prior to real-time use so they can be fixed. This is an on-going challenge of software management and should be a continued concern with any application, especially those that will be depended upon in times of crisis.

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VI. CONCLUSION

A. CONCLUSION

The need to communicate is the foundation of any successful relief effort. This research explored, tested, and demonstrated the benefits and possible uses of mobile applications under the umbrella of a HFN for HA/DR operations. Immediately following a disaster, there is a need to assess damage, plan a response, and coordinate efforts. There is instantly a gap of information that needs to be filled. Mobile applications that are able to be employed in austere environments are one way to fill this information gap. Deployed field teams with the equipment and technology researched in this thesis will have the ability to communicate with each other and the necessary authorities instantaneously through mobile applications.

During demonstrations at CV13, Lighthouse was used successfully in ICT assessments by a RTAT in a simulated disaster scenario. The HFN was verified to be the foundation and fundamental necessity to provide the conversation space to share information in an austere environment. While there are more applications that apply to HA/DR operations in development, this research was intended to demonstrate the unlimited possibilities of such technology and its benefits to disaster responders.

Typhoon Haiyan tested the real world functionality and ability of HFNs and the Lighthouse mobile application. The technology proved to be extremely useful and enhancing as the NPS HFN group was able provides a network and assesses the ICT situation. With the Lighthouse application, data was fed into and displayed on the Pacific Disaster Center's DisasterAWARE website for all responders with web access to analyze. The NPS HFN group is currently working with the Lighthouse group in testing and exploring the possibilities and improvements of the application.

While not currently available for military use, FIST is a mobile application that displays other possibilities and potential of mobile applications. The NPS HFN group is currently not able to work with the technology, but research of the application shows great promise and benefits of the program. Further research is recommended.

B. FUTURE WORK

There is additional work and research that needs to be done to explore the full potential of mobile applications for HA/DR. The recommended research is related to software expansion, security, and training.

1. Software Expansion

Once the groundwork is complete for any software program, the possibility for improvement never ends. The applications researched and tested in this thesis proved to be valuable, but have many possible expansions and upgrades that should be explored. Additional chat features, logistical information, and automatic data forwarding features should be explored further to enhance these applications. As the use of these applications continues, more expansion and upgrade ideas need to be explored.

2. Security

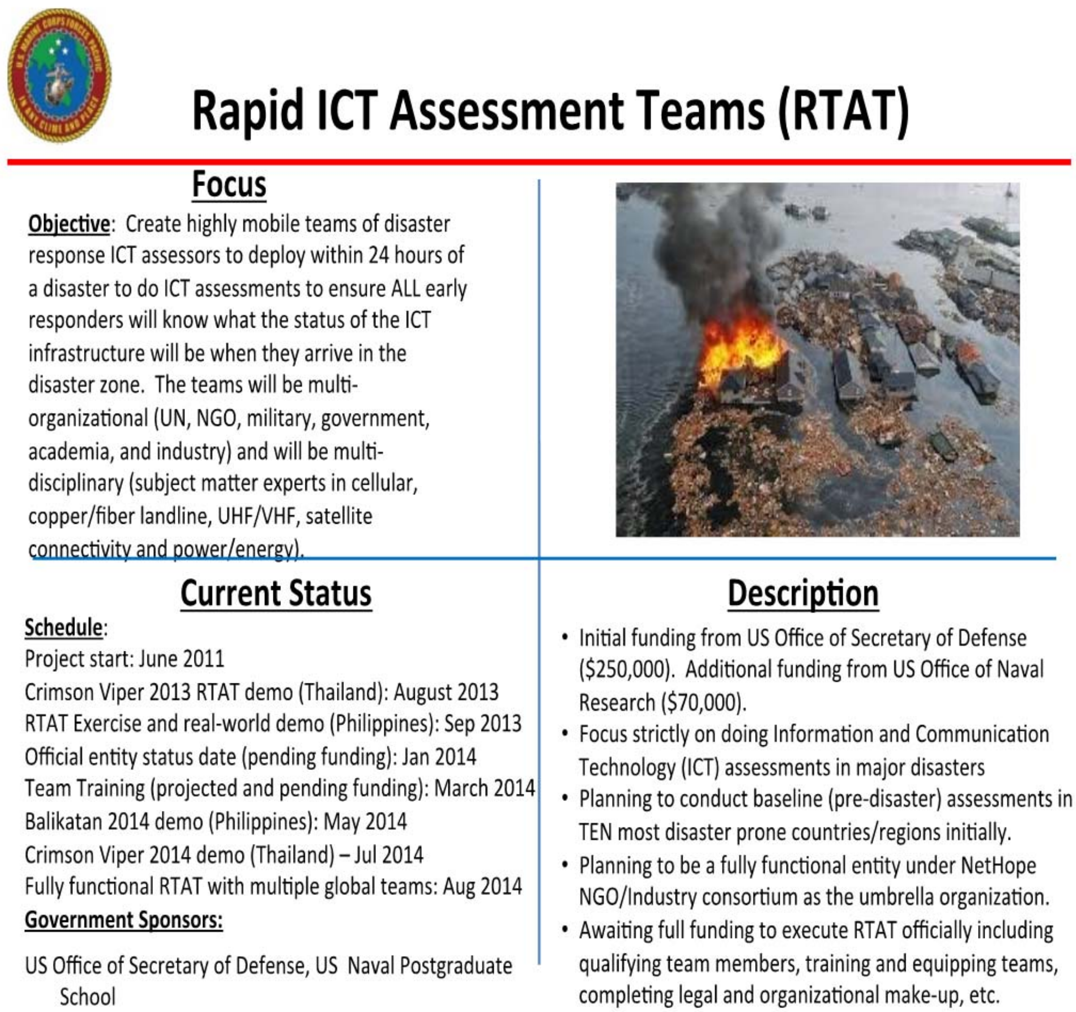
The responders of any disaster will come from many different organizations, as was the case in the response to Typhoon Haiyan. The RTAT formed during the mission consisted of multi-organizational participation. Due to this, a multi-level security feature or system needs to be explored to control the access to the HFN and applications. A comprehensive study needs to be conducted to determine a security structure to facilitate who has access to the system.

3. Training

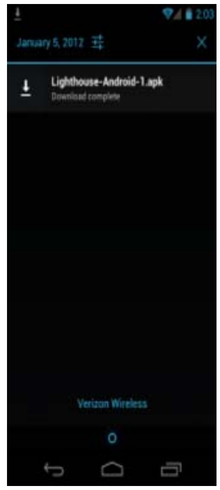
As the technology expands and the applications get greater in detail, they can be complicated. It is recommended that each application have a comprehensive instruction guide as well as a quick-book for fast reference for the responder. A standard reference guide for HFN construction as well as application instruction should also be readily available for RTAT members.

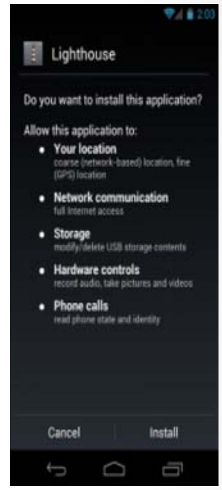
VII. APPENDIX

A. LIGHTHOUSE POWERPOINT BRIEF



How to Download Lighthouse (Android)



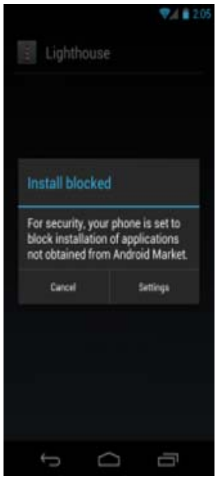


Go to http://lhproject.info/install/ in your browser.

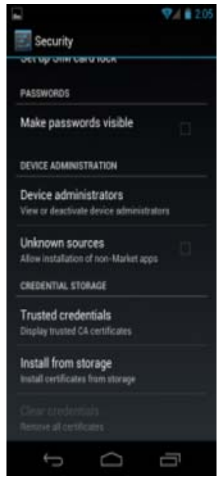
Touch on the Lighthouse.apk link to download the app (APK file).

Touch the application in your notification drawer to open the install screen.

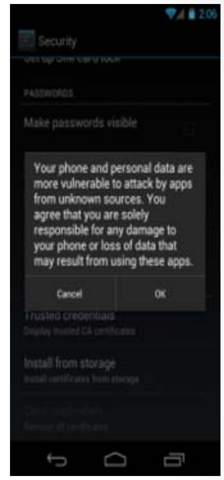
How to Download Lighthouse (Android)



On the install screen, touch install. You may get an 'install blocked' error if you have not set your device to allow non-market apps to be installed.

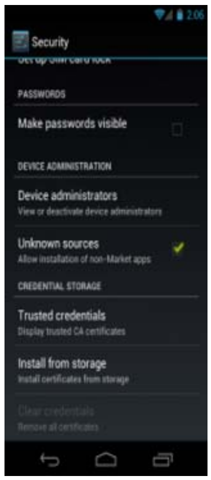


Touch settings and check the box allowing non-market or unknown sources to be installed.

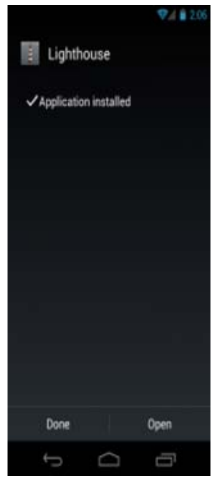


You will get a warning saying your device is at risk. Since we know where this app is coming from, it is 'ok'.

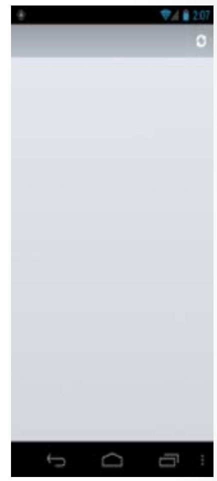
How to Download Lighthouse (Android)



Once you have allowed non-market or unknown sources to be installed, you should see a check mark on the security settings box next to this option.



Click the back arrow to go back to your browser or install screen. If yougo back to your browser, you will need to select your downloads folder. Orclick. the link again to download the app if you can't find your previously downloaded file. Once you are back to the install screen, touch 'install' and you should see a success screen



Touch Open to open the app immediately or click done to finsh.

How to Download Lighthouse (Android)

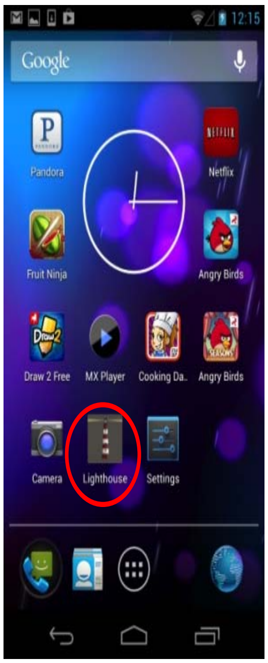
Open the settings of the app by touching the secondary menu button and input your username, password, and uncheck the 'Sync on start' and 'Autosync' options.
Username: demo
Password:

Return to the main screen of the app and touch the sync button in the top right corner of the screen. If you successfully entered a valid username and password, the device will start to synchronize.
When the app is finishing synchronizing, you are ready to start collecting.

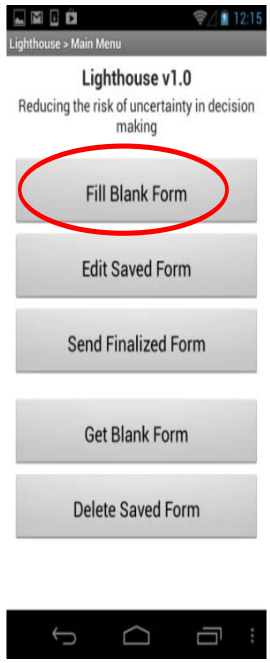
How to use Lighthouse

Rapid Technology Assessment Team (RTAT) Mobile Data Collection Tool

1. Open the lighthouse application



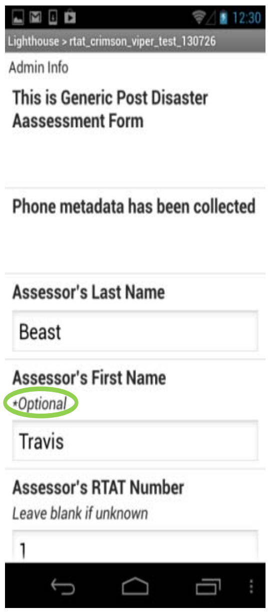
2. Select "Fill Blank Form"



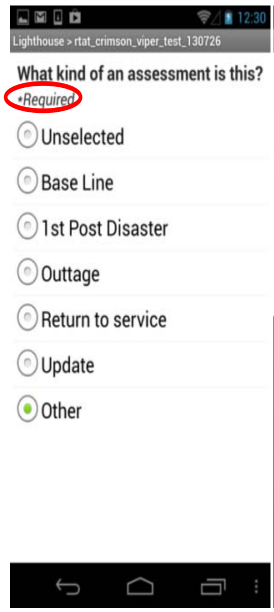
3. Scroll and Select latest RTAT Form

How to use Lighthouse

4. Admin Page



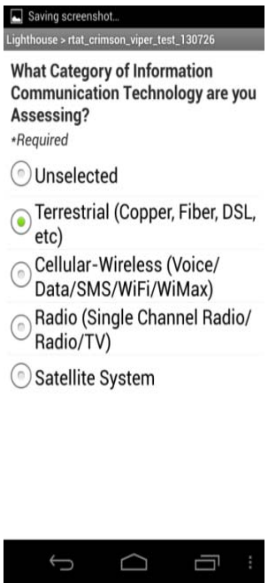
5. Kind of Assessment



5.a "Other" (Future Use)
Use sparingly

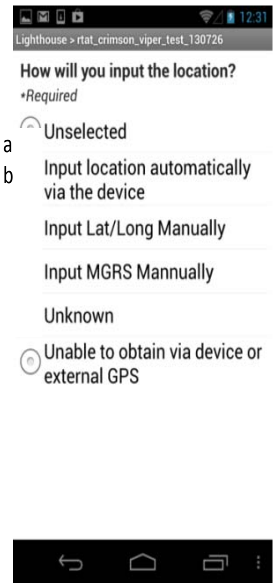
How to use Lighthouse

5. Type of Information Communication Technology (ICT)- Fill out separate forms for multiple services at the same location

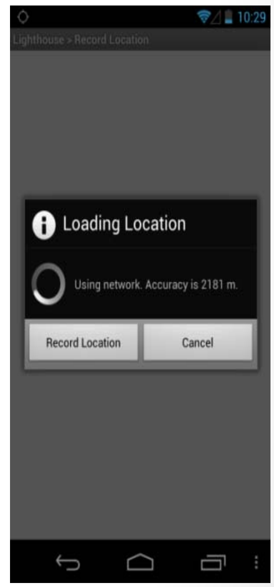


6. How will you input location 'Device' requires imbedded GPS

a
b



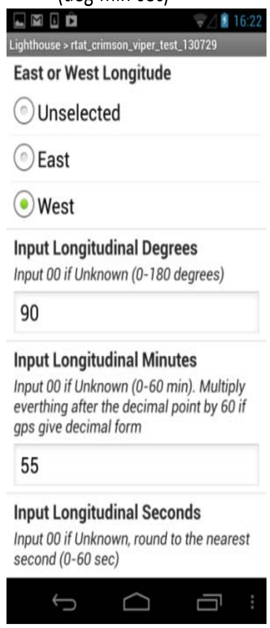
6.a. Device GPS: select 'record location' when accuracy is displayed.



How to use Lighthouse

6.a. Outcome

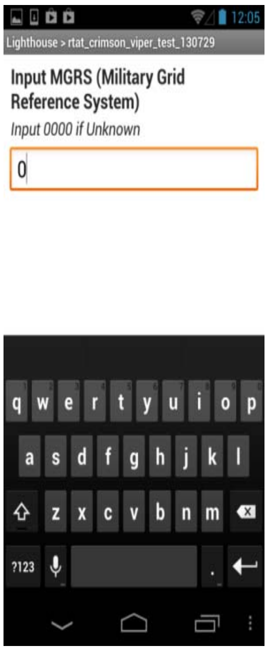
6.b.1. Input Longitude (deg-min-sec)



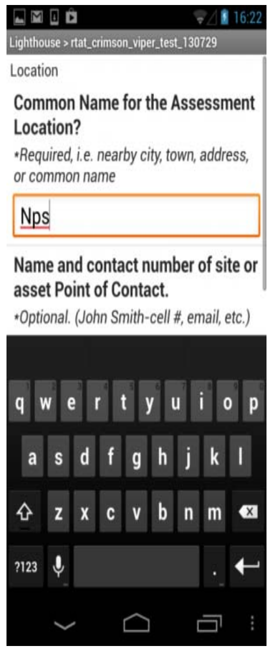
6.b.2 Input Latitude (deg-min-sec)

How to use Lighthouse

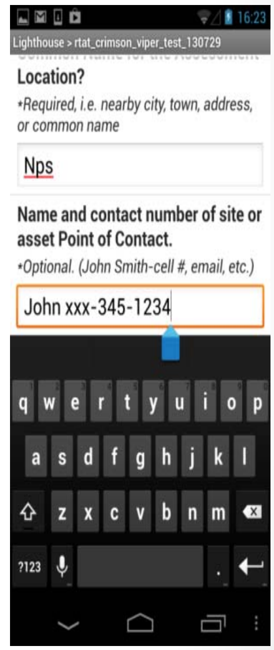
6.c. Military Grid Reference System (MGRS)



7.a Common Name and POC info information

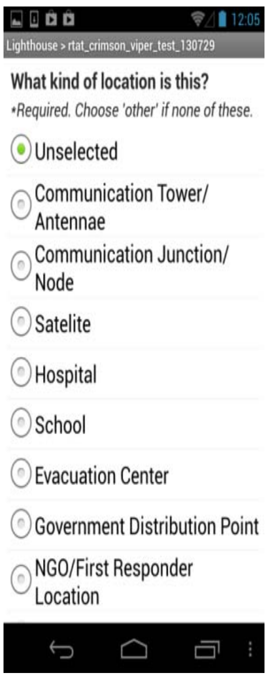


7.b Point of Contact

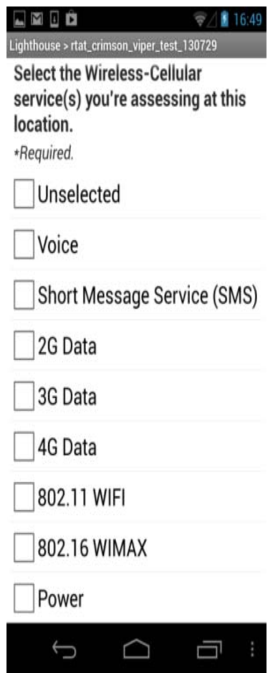


How to use Lighthouse

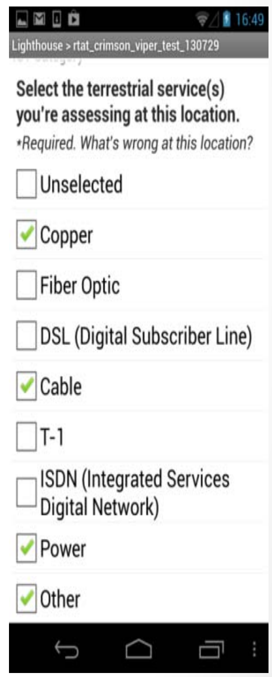
8. Kind of location



9.a. Information Communication Technology (ICT) Terrestrial Stand-alone power assessment



9.b. ICT Cellular-Wireless

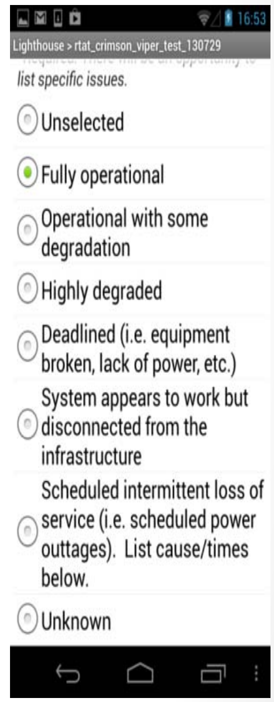


How to use Lighthouse

9.c. ICT Radio

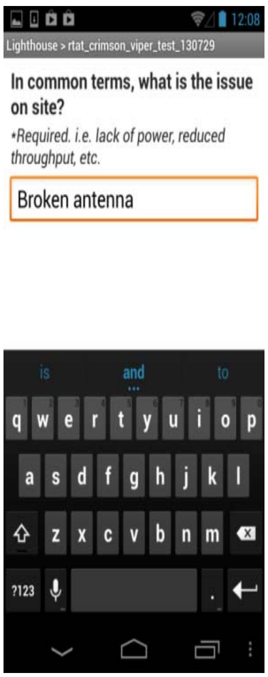
9.d. ICT Satellite System

10. Status of services assessed



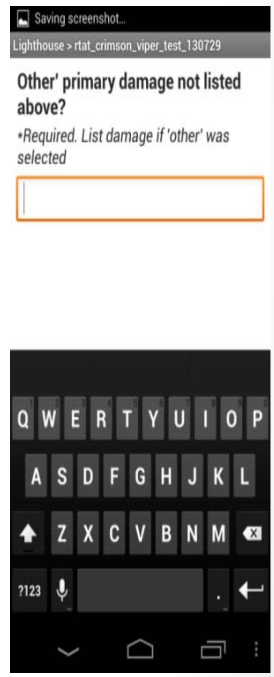
How to use Lighthouse

11. Plain terms, non-technical audience, “What’s the problem?”



12. Primary (Required), Secondary and Tertiary (optional) cause(s) of the damage?

12.a ‘Other’ Damages (use sparingly.

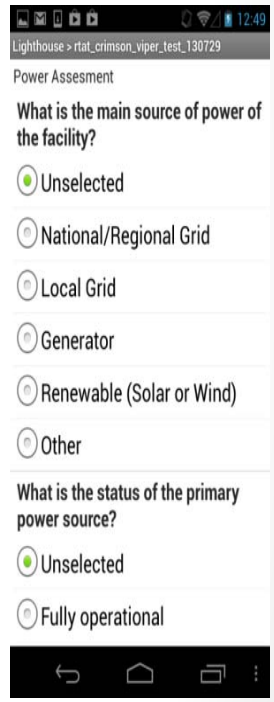


How to use Lighthouse

13. Technically-Technical Audience
“What’s the problem?”

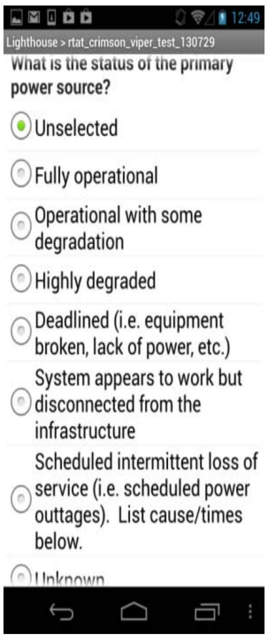
14. What’s needed to fix the issue.
Plain, non-technical, terms.

15. Main Power Source

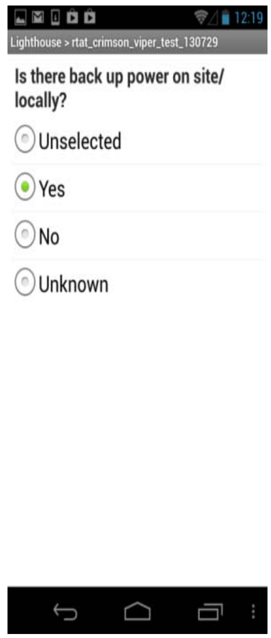


How to use Lighthouse

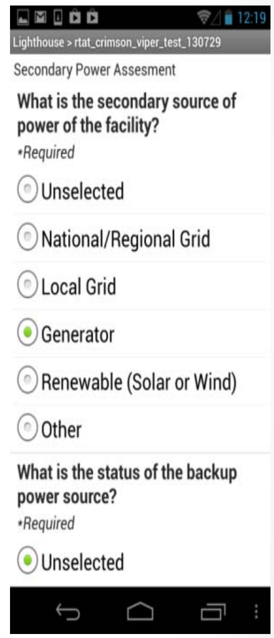
15.a. Status of Primary power source.



16. Backup power on site?

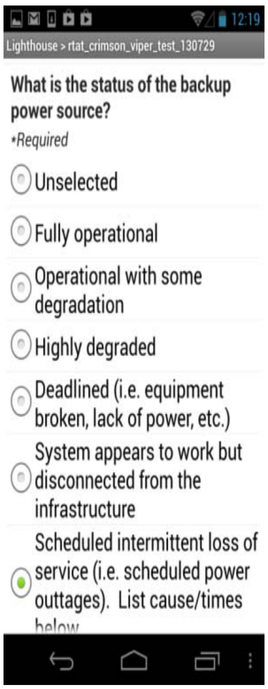


16.a. Backup power source?

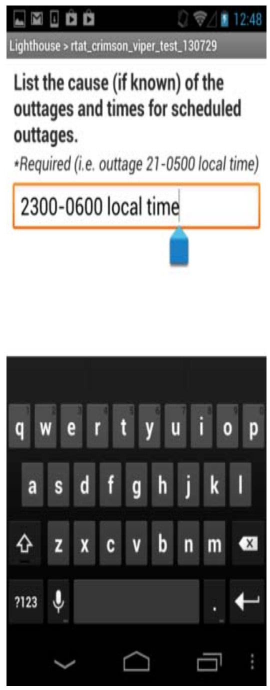


How to use Lighthouse

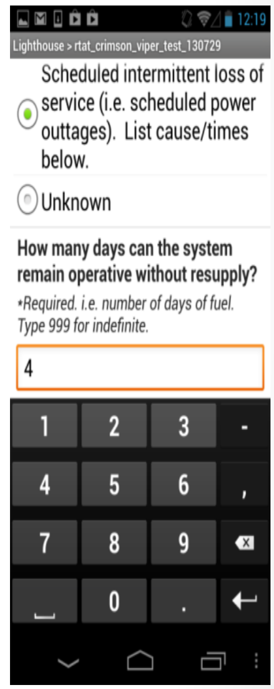
16.b. Status of backup power



16.c. Intermittent times

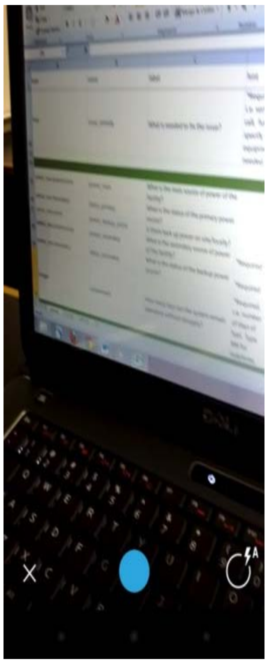


17. Days until resupply required?

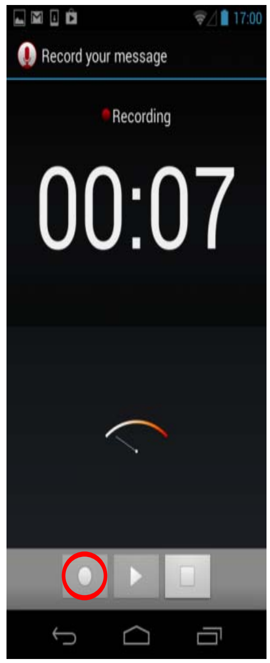


How to use Lighthouse

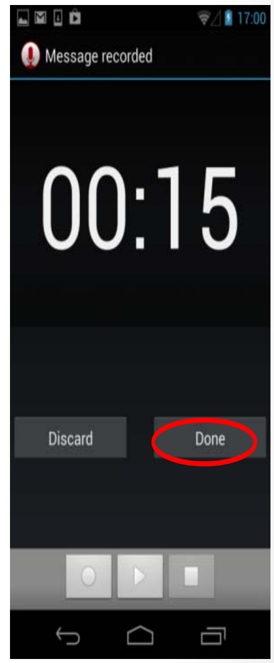
18. Take a photo (only one photo)



19.a. Record audio (use sparingly) (select record button)

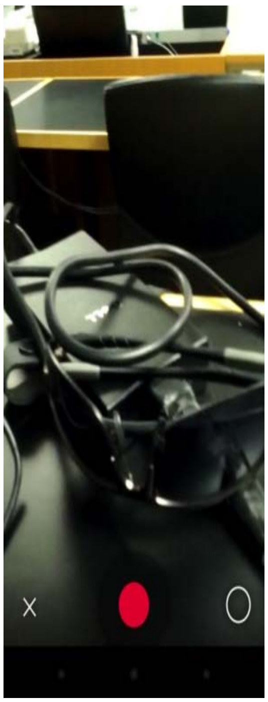


19.b. Recorded audio results (playback capability



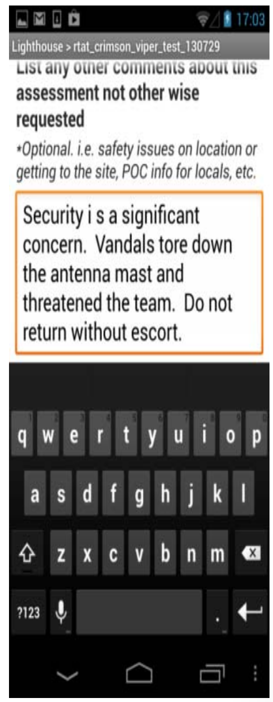
How to use Lighthouse

20. Record a video (use sparingly)



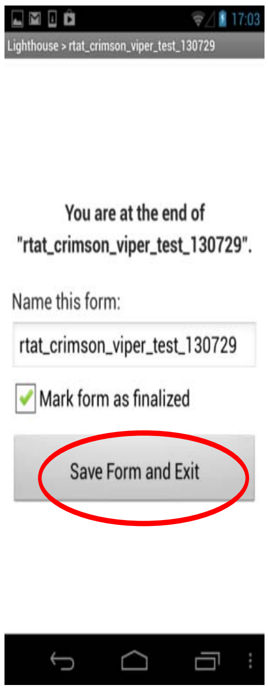
20.a. Video results/playback

21. Final qualitative comments.

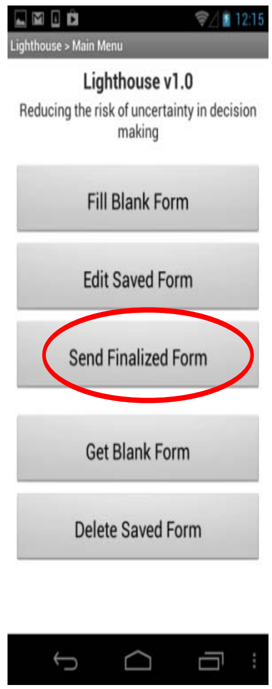


How to use Lighthouse

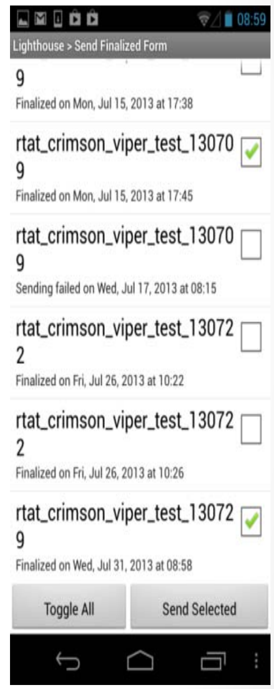
22. Save and Exit



23. Send Finalized Form

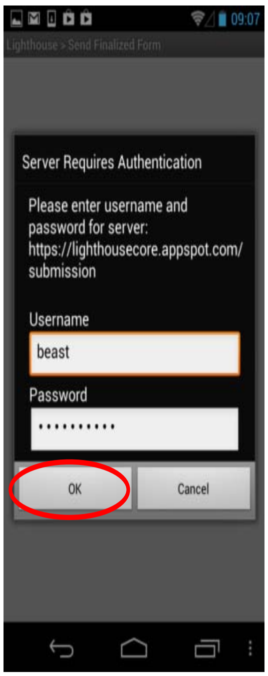


24. Select the saved form



How to use Lighthouse

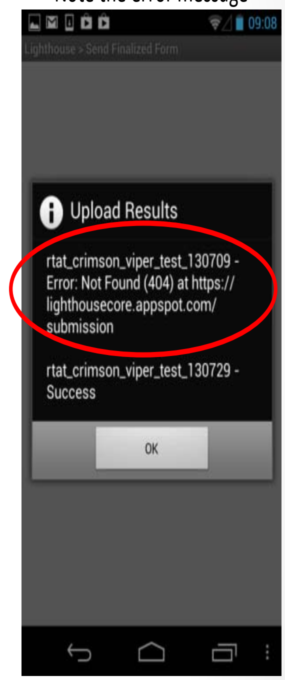
25 Verify Username/password



26. Select 'OK' Send

27. Results

Note the error message



B. DEFINITIONS

Bandwidth–The transmission range of an electronic communications device or system the speeds of data transfer.

BGAN–Broadband Global Area Network terminal, which is a satellite earth terminal owned and operated by Inmarsat.

Command and Control–The means by which a commander recognizes what needs to be done and sees to it that appropriate actions are taken.

Communication–the imparting or exchanging of information or news.

Common Operating Picture (COP)–A Common Operating Picture is a single identical display of relevant information shared by more than one command. A COP facilitates collaborative planning and assists all echelons to achieve situational awareness.

Data Fusion–Data fusion is the process of integrating multiple data and knowledge sources representing the same real-world object into a single consistent, accurate, and useful representation.

First Responder–A certified, often volunteer, emergency, medical, law enforcement officer or military member who is first to arrive at an accident or disaster scene.

HA/DR–Humanitarian Assistance/Disaster Relief is a mission that is deployed to a disaster zone.

Hotspot–A hotspot is a site that offers Internet access over a wireless local area network using a router connected to a link to an Internet service provider. Hotspots typically use Wi-Fi technology.

ICT–Information and Communication Technology. Refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums.

RTAT–Rapid Technology Assessment Team is an assessment team comprised of Netted Humanitarians that is deployable within 12–24 hours of a disaster-taking place. The mission of RTAT is to conduct an early assessment of the impact the disaster had on the ICT infrastructure of the affected area.

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